



HYDROGEN MASER CLOCKS

Hydrogen maser clocks are the most precise clocks in the world, offering the highest short-term stability : time remains stable up to 100 times better than a Rubidium clock !

There are two different types of maser clocks : active clocks and passive clocks. These clocks are very complex systems. Most of their critical parts are the following:

- ❑ The hydrogen tank (the hydrogen atoms are stored in very specific solid and porous materials) and the radio frequency dissolution system of hydrogen molecules into excited individual atoms;
- ❑ The selection system of excited hydrogen atoms so as to keep only atoms able to generate the required clear frequency signal;
- ❑ The large-sized quartz unit covered with a thin layer of Teflon. The manufacturing process requires very special equipments;
- ❑ The microwave cavity able to « question » the hydrogen atoms trapped into their quartz bulb which has to be manufactured and adjusted with high precision;
- ❑ The high-precision assembling of different mechanical and magnetic elements which compose the maser.



Since 2001, Orolia has developed a spatial passive hydrogen maser for the Galileo satellites' navigation system from a Vremya firm's Russian patent and a laboratory prototype developed by Neuchâtel Observatory. This maser is the unique in the world. Its performances are unequalled by any other technologies. It will be Galileo's primary clock and give it an unreachable sub-metric precision level by other navigation systems.



In March 2006, through its subsidiary called T4Science, Orolia gets active maser technology and the Neuchâtel Observatory's products portfolio. Nowadays, the demand for these products is important, as for instance for very stable clocks, essential to scientific applications like geodesy and radioastronomy, as much as for floor-based control and surveillance stations of satellite navigation programs. The unit price of this equipment is several hundredth of thousandth of euros.

